Oct. 20, 1942. C. M. MacCHESNEY 2,299,101

WINDING REEL

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FIG. 1.

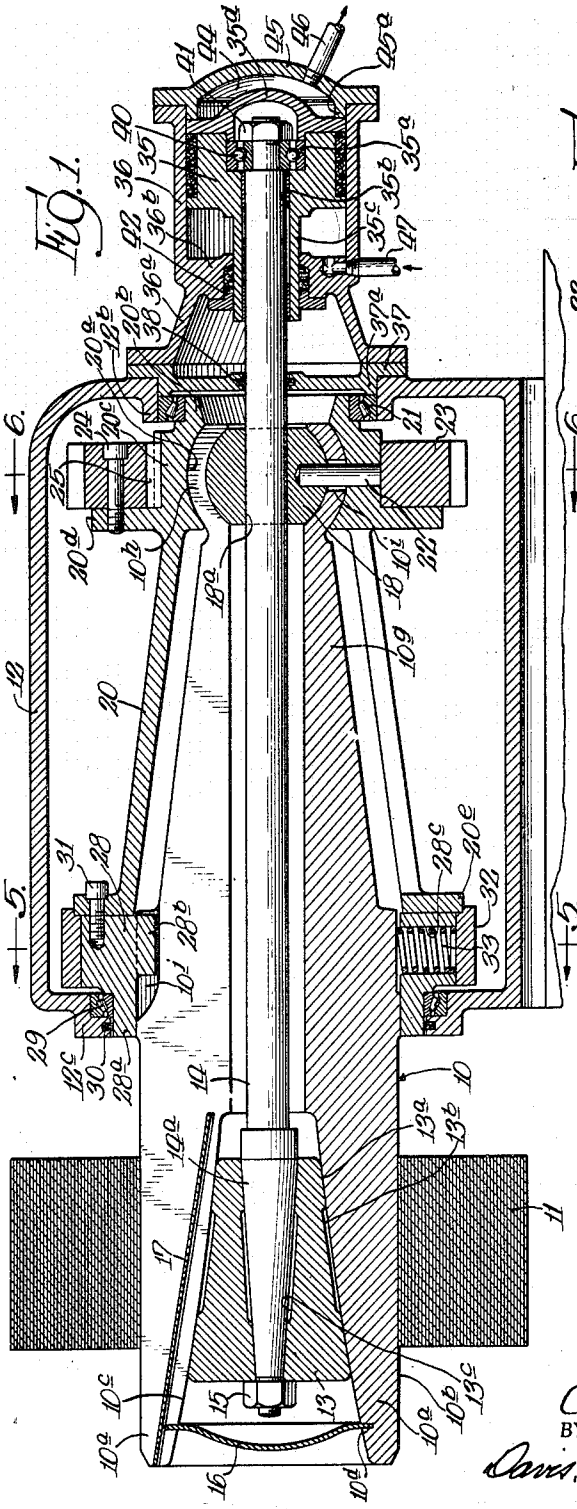
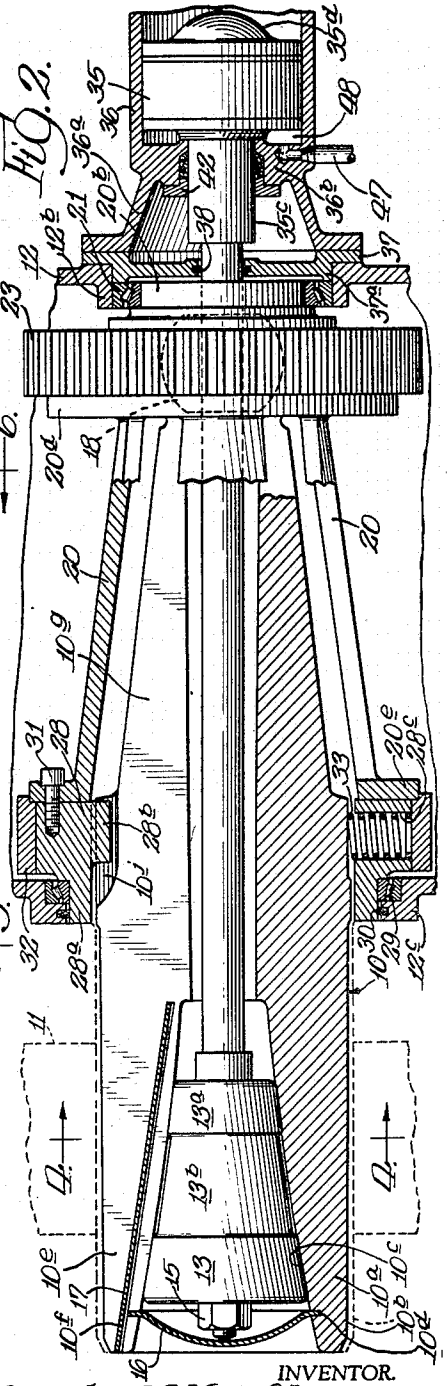


FIG. 2.



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Fig. 5.

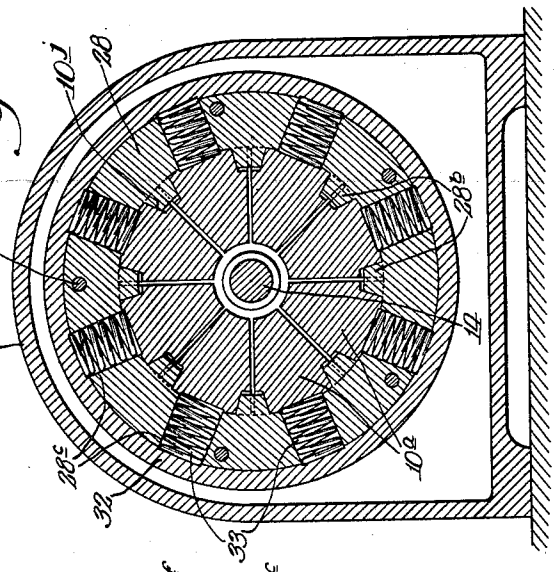


Fig. 6.

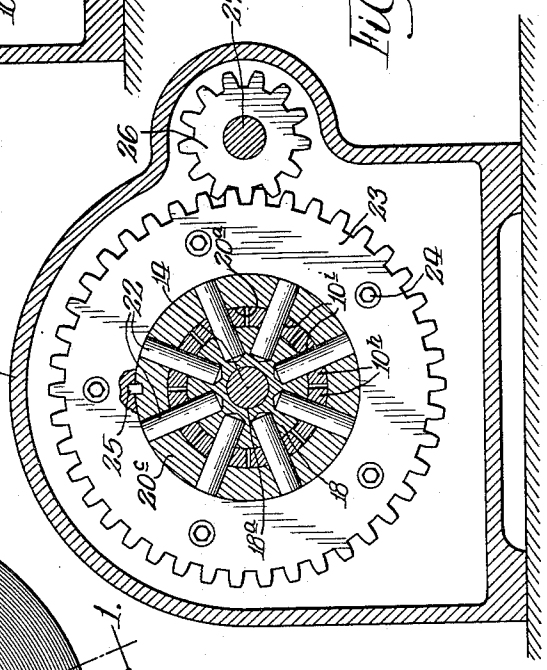


Fig. 4.

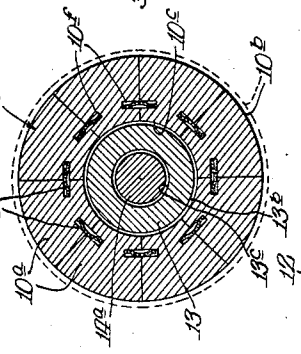
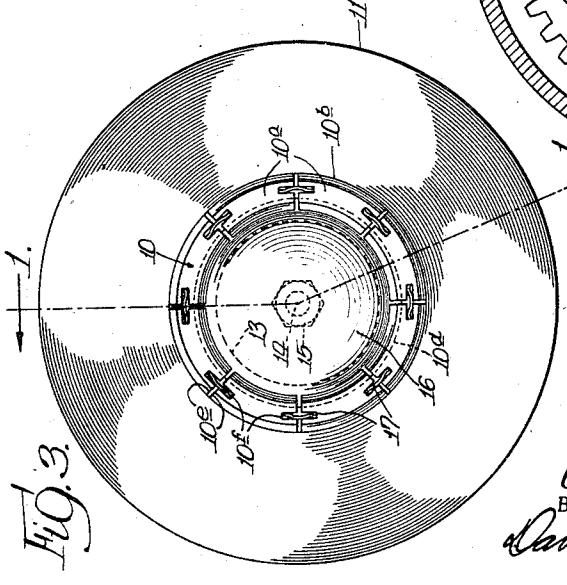


Fig. 3.



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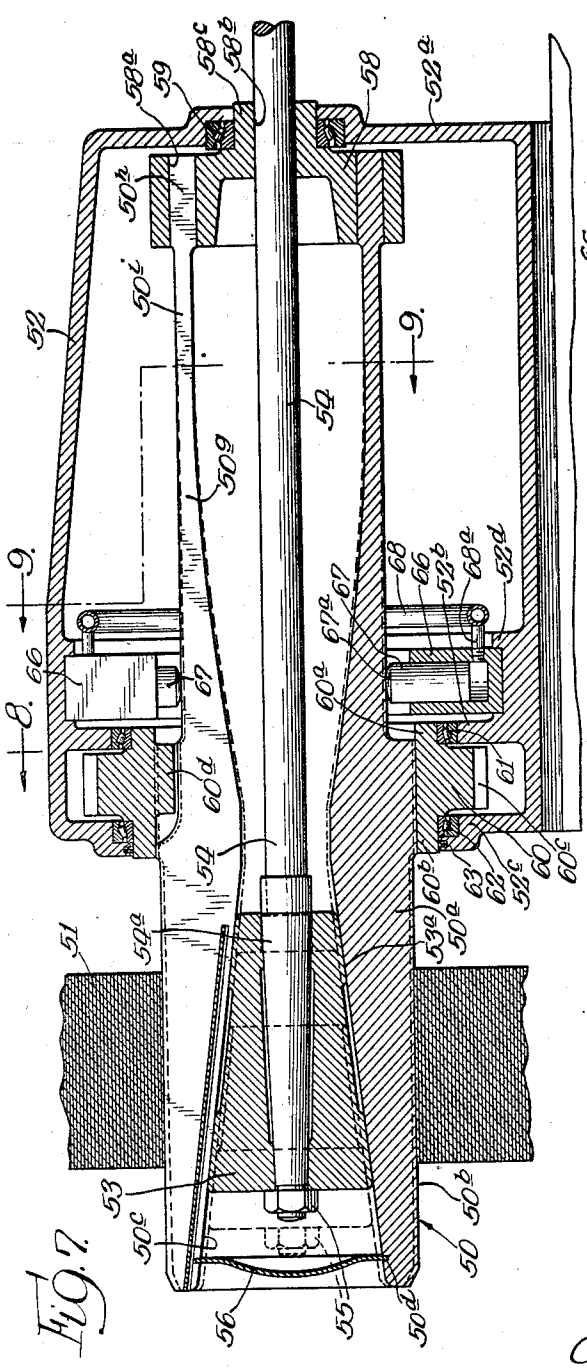


FIG. 7.

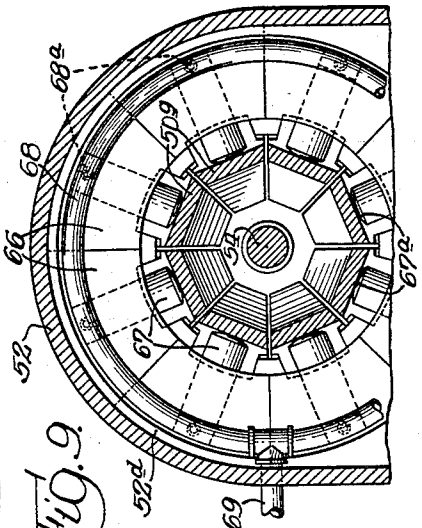


FIG. 9.

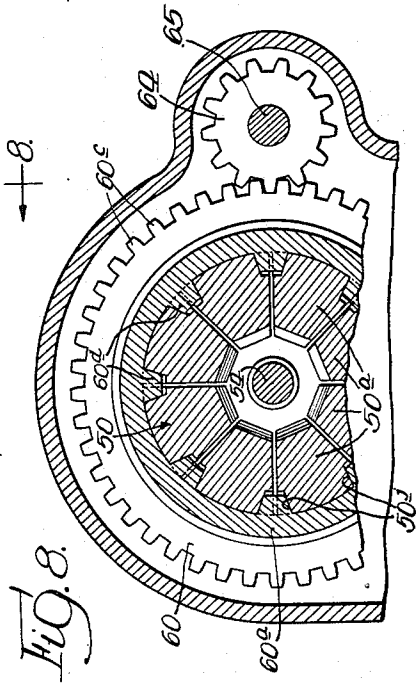


FIG. 8.

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# UNITED STATES PATENT OFFICE

2,299,101

## WINDING REEL

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Application May 31, 1941, Serial No. 395,967

34 Claims. (Cl. 242—72)

This invention relates to improvements in winding reels and its purpose is to provide an improved reel of simplified construction which may be used with advantage for winding strip steel and the like in spiral coils.

It is common practice in the rolling of strip steel in steel mills to wind the strip material in spiral coils as it comes from the mill stands and for this purpose power driven winding reels are in general use. To permit the coil of strip material to be held firmly during the winding operation, and to allow the completed coil to be removed readily at the conclusion of the winding operation, it is necessary to be able to expand and contract the core of the reel. This has been accomplished in commercial practice, according to one plan commonly employed, by the use of a reel having a core made up of a plurality of outer segments capable of radial expansion under the influence of rollers interposed between the segments and an inner rotatable actuating member provided with inclined cam surfaces adapted to cause radial movement of the core segments, through the intervening rollers, upon relative rotative movement of the segments and the actuating member. In order to retard one of the relatively rotatable units, brake mechanism has commonly been employed and the power for effecting rotation of the reel during the winding operation has been applied to the inner actuating member. In that apparatus, very high pressures per unit of area are set up between the rollers and the core segments and between the rollers and the inclined wedging surfaces of the actuating member, thereby causing the rupture of the lubricating oil films, the rapid wear of the contacting surfaces, and the frequent sticking of the rollers, thus rendering the operation of the apparatus unreliable. These difficulties have been increased by reason of the fact that the driving power has been applied to the inner member, giving rise to a tendency to wedge and lock the rollers during the normal rotation so that they could not be readily released when desired; and the necessity for mounting the segments for free radial movement under the influence of the segments has resulted in a tendency of the rollers to tilt endwise, instead of maintaining their proper positions as parts of a true cylinder.

The principal object of the present invention is to overcome the foregoing difficulties, and others, by providing an improved simplified winding reel in which the power for effecting rotation is applied directly to the segments upon which the strip material is wound and in which the expansion and contraction of the segments is effected in a positive and simple manner. A further object is to provide a winding reel having a plurality of expansible and contractible segments which are moved radially without the use of any brake mechanism and without the use of rollers. Another object is to provide a winding reel having radially movable segments adapted to be actuated by a tapered expanding member which has only an annular line contact with the segments in all positions except one, which may correspond to the expanded condition of the core, so that the resistance to movement of the expanding member is comparatively limited. Another object of the invention is to provide a winding reel having a plurality of segments to which the rotative power is directly applied at points adjacent to the region where the coil is wound, thus eliminating any tendency for the segments to tilt or twist during the winding operation. Still another object of the invention is to provide a winding reel having a plurality of core segments which are always anchored securely at one end and which are driven by power applied directly thereto. Still another object of the invention is to provide an expansible and contractible winding reel core wherein the radial movement of the core segments is effected by a power actuated member directly engaging the segments with a pressure which is independent of the driving force applied to the reel and independent of the inertia of the coil wound thereon. A further object of the invention is to provide a winding reel having radially movable segments in combination with actuating means having relative movement with respect to the segments, and provided with means for preventing the access of dust and the like to the relatively movable parts by which the expansion and contraction of the segments is effected. A further object of the invention is to provide a winding reel having a minimum number of parts which may be readily manufactured and assembled. Other objects relate to various features of construction and arrangement which will appear more fully hereinafter.

The nature of the invention will be understood from the following specification taken with the accompanying drawings in which two embodiments are illustrated. In the drawings,

Figure 1 shows a longitudinal section through a winding reel embodying the features of the present invention, the segments of the core being illustrated in their expanded condition;

Fig. 2 is a longitudinal sectional view, similar

to that shown in Fig. 1 except that the driving gear and expanding mechanism are shown in elevation and the segments of the core are illustrated in their contracted condition;

Fig. 3 shows an end elevation of the apparatus illustrated in Fig. 1;

Fig. 4 shows a vertical section taken on the line 4—4 of Fig. 2;

Fig. 5 shows a vertical section taken on the line 5—5 of Fig. 1;

Fig. 6 shows a vertical section taken on the line 6—6 of Fig. 1;

Fig. 7 shows a longitudinal axial section through a winding reel embodying a modified form of the invention;

Fig. 8 shows a vertical section taken on the line 8—8 of Fig. 7; and

Fig. 9 shows a vertical section taken on the line 9—9 of Fig. 7.

In the form of the invention shown in Figs. 1 to 6, inclusive, the winding reel comprises a core 10 made up of a plurality of complementary segments 10a, each having an arcuate surface 10b which is adapted to cooperate with the similar surfaces of the other segments to form a substantially continuous cylindrical surface upon which a coil of strip steel 11, or the like, is adapted to be wound. The portions of the segments upon which the winding surfaces 10b are formed project beyond the open end of a housing 12 within which portions of the segments and parts of the driving mechanism are mounted. The outer projecting portions of the segments are provided on their inner sides with arcuate inclined surfaces 10c which converge inwardly toward the housing 12 and which are adapted to coact with an expanding member 13, constructed in the form of a truncated cone, mounted upon the end of an actuating rod 14 adapted to be moved in either longitudinal direction by fluid pressure mechanism. The rod 14 is provided with a tapered end portion 14a which is adapted to fit a correspondingly tapered axial bore formed in the expanding member 13 and the extremity of the rod 14 is threaded for engagement by a nut 15 by which the expanding member is held in position on the rod. The surfaces 10c may be convexed inwardly between their ends or their longitudinal elements may be straight to facilitate manufacture. In either case, it is apparent that there will be only one position of the expanding member 13 where it will contact from end to end with the surfaces 10c and that in all other positions there will be only an annular line contact. The surfaces may be so formed that the complete contact between the segments and the expanding member will occur in the expanded condition of the core, when it is carrying the greatest load, while in other positions the annular line contact will limit the friction so that the expanding member may be more readily moved. By arranging for an annular line contact in the fully expanded condition of the core, the resistance to starting the movement of the expanding member when the core is loaded will, of course, be materially reduced. To effect a further reduction of the resistance to movement of the expanding member, its outer tapered surface 13a is recessed annularly as shown at 13b, and this also insures a better contact between the end portions of the expanding member and the segments. To insure a good contact of the tapered portion 14a of the actuating rod and the expanding member, the internal bore of the expanding member is enlarged between its ends as shown at 13c.

In order to prevent the access of dust and the like to the contacting surfaces of the segments 10a and the expanding member 13, the inner surfaces of the segments 10a are provided with grooves 10d which align with each other circumferentially and which receive the marginal edges of a disk 16, formed of leather, rubber or the like, which is adapted to adjust itself to the radial movements of the core segments and to maintain a closure across the outer end of the expanding member 13. For the same reason, the longitudinal die faces 10e of the segments are provided with grooves 10f which are inclined longitudinally to correspond with the taper of the surfaces 10c. These grooves 10f register with each other in the opposite faces 10e of adjacent segments and they are occupied by the edges of flexible connecting members 17, formed of leather, rubber or the like, which are coextensive with the surfaces 10c and which are adapted to prevent the entrance of dust or the like in a radial direction to the contacting surfaces 10c and 13a.

The segments 10a of the core 10 are provided with elongated arms or extensions 10g which project into the housing 12 and which terminate in arcuate extremities 10h mounted to oscillate upon the spherical surface of a bearing member 18 which has a central bore 18a slidably and rotatably engaged by the rod 14. When the segments 10a expand and contract, as hereinafter described, the arcuate portions 10h are adapted to oscillate upon the bearing member 18. These portions 10h are maintained in contact with the bearing member 18 by a driving bracket or cage 20 which, for purpose of assembly, may be formed in two laterally separable parts molded together. The cage 20 acts as a driving frame through which the power for effecting rotation is applied directly to the segments 10a of the core, and it is provided with an annular arcuate surface 20a adapted to contact with the outer curved faces of the portions 10h of the segments, as shown in Fig. 1, so that the parts 10h may oscillate within the surface 20a when the outer ends of the segments are moved radially. Adjacent the annular surface 20a, the driving frame 20 is provided with an annular flange 20b which is located in a concentric position with respect to a flange 12b formed on the housing 12. A roller bearing unit 21, having its rollers mounted in inclined positions, to receive thrusts toward the right, as viewed in Fig. 1, is mounted between the flanges 20b and 12b, thus providing a bearing for the inner end of the frame 20.

In order to provide a driving connection between the parts which have just been referred to, a series of radial pins 22 are mounted in registering apertures formed in the part 20c of the frame upon which the surface 20a is formed, through the parts 10h of the segments 10a, and extending into the bearing member 18, as illustrated in Figs. 1 and 6. The apertures 10i in the parts 10h, which are engaged by these pins, are elongated in the direction of the axis of the device, to permit the segments to oscillate about the member 18. These pins 22 are retained in position by an annular driving gear 23 which fits upon the outer cylindrical surface of the part 20c and which is secured to a radially extending flange 20d of the driving frame by means of a series of threaded studs 24. A key 25 engages aligning keyways in the part 20c and in the gear 23 to prevent relative rotation of these members independently of the studs 24 by which they are secured together.

The gear 23 meshes with a driving pinion 26

which is secured upon a shaft 27 journaled in bearings carried by a lateral extension of the housing 12, as shown in Fig. 6. This shaft is adapted to be connected to an electric motor or other source of power so that, when desired, power may be applied to rotate the reel 10 and thus wind the coil of strip metal 11 thereon. In order that the driving force may be applied to the reel, not only at the innermost end thereof, but at a point nearer to the place where the strip material is wound upon the segments of the reel, thereby preventing the tilting and twisting of the segments during the winding operation, the driving frame 20 is extended toward the mouth of the housing 12 and is provided with a radial flange 20e to which there is secured a driving member 28, of annular form, provided with a forwardly extending flange 28a which is adapted to rotate within and in proximity to the flange 12c of the housing. An annular roller bearing unit 29 is mounted in an annular recess formed in the housing and on the outer side of the flange 28a to support the driving member 28 and the forward end of the driving frame 20 during their rotation. A packing ring 30 is mounted in an annular groove formed in the inner face of the flange 12c to bear against the outer side of the flange 28a, thus preventing dust and the like from gaining access to the contacting surfaces of the roller bearing unit 29.

The driving member 28 is secured to the flange 20e of the driving frame by means of a series of studs 31 and this driving member is provided on its inner annular surface with a series of radially projecting teeth 28b which are adapted to enter notches 10j formed in the enlarged intermediate portions of the segments 10 of the reel, two of these notches in adjacent segments registering with each other to form, in effect, a recess between two adjacent teeth so that, as the driving frame 20 is rotated under the influence of the power applied to the driving gear 23, the driving member 28 supplies a driving force to the segments 10a adjacent to the forward end of the housing 12. The driving member 28 is provided with a series of radially extending cylindrical apertures 28c and these apertures are normally closed at their outer ends by an annular ring 32 which surrounds the driving member, being shrunk thereon or otherwise secured thereto. Within each of the apertures 28c there is mounted a coil spring 33 and the function of these springs is to force the segments 10a inwardly against the expanding member 13 so that when this expanding member is moved toward the left, as viewed in Fig. 1, to the position shown in Fig. 2, these springs cause the segments 10a to move inwardly away from the annular driving member 28, thereby effecting the contraction of the projecting portion of the reel to the extent permitted by the adjustment of the expanding member 13 therein.

The movement of the expanding member 13 for the purpose of controlling the expansion and contraction of the reel 10 is effected by a piston 35 which is connected to the rod 14 and which is mounted to reciprocate within a cylinder 36. This cylinder has a forward extension 36a provided with an annular flange which seats against the outer face of a circular plate 37, the flange and the plate being secured to the rear end of the housing 12 around the opening in which the roller bearing unit 21 is mounted. The plate 37 has an annular part 37a which fits within this aperture and it is provided with a central opening through which the rod 14 extends, a packing ring 38 being mounted in a groove around this opening to bear against the rod and provide a dust tight connection between the rod and the plate. The piston 35 is loosely engaged by the rod 14 so that this rod may rotate within the piston during the normal rotation of the winding reel, a ball bearing unit 40 being mounted on the reduced end of the rod and within an annular recess 35a formed in the piston. A nut 41 engages the threaded end of the rod to hold it in fixed longitudinal position with respect to the ball bearing unit and the piston. The central passage 35b of the piston is loosely engaged by the rod 14 and the piston has a tubular extension 35c surround the rod and slidably engaging an aperture formed in the end wall 36b of the cylinder. A stuffing box 42 is mounted in the end wall 36b around the tubular extension 35c of the piston to provide a fluid tight connection between these parts. A metal cap 35d closes the rear end of the piston and extends over the end of the rod 14 and the nut 41. When the piston 35 is in its retracted position, as shown in Fig. 1, corresponding to the expanded condition of the reel, a space 44 is provided between the cap 35d and the head 45 of the cylinder which has an inwardly extending flange 45a adapted to limit the rearward movement of the piston. Compressed air or the like is adapted to be admitted to the space 44 through a pipe 46, leading from an air compressor or the like, and another supply pipe 47, for compressed air or the like, communicates with the space between the other end of the piston 35 and the end wall 36b of the cylinder. By admitting compressed air or other fluid to the end of the cylinder adjacent the head 45, the piston 35 will be moved toward the right, as viewed in Fig. 1, thus expanding the segments of the core so that they are in condition for the winding thereon of the spiral coil 11. Upon admitting compressed air or the like through the pipe 46 to the chamber at the rear end of the cylinder 36, the piston 35 will be moved from the position shown in Fig. 1 to the position shown in Fig. 2, thus moving the expanding member 13 to its forward position and allowing the segments 10a of the reel to be contracted under the influence of the coil springs 33. When the parts are in this condition, the coil 11 may readily be withdrawn from the reel. When the piston 35 is in this forward position, as shown in Fig. 2, there is a space 48 between the forward end of the piston and the end wall 36b of the cylinder so that when compressed air is again admitted through the pipe 47, it may have access to the entire face of the forward end of the piston to cause its movement in the opposite direction.

The form of the invention shown in Figs. 7, 8 and 9, which is now considered to be the preferred form of the invention, comprises a core 50 made up of a plurality of segments 50a having outer arcuate surfaces which form a composite cylinder upon which the spiral coil 51 of strip steel or the like is adapted to be wound. These segments 50a extend rearwardly into a housing 52, as in the form of the invention previously described, and the expansion of the forward portions of the segments is adapted to be effected by an expanding member 53 having, in general, the form of a truncated cone and having, also, the function of controlling the contraction of the segments under the influence of fluid pressure mechanism hereinafter described. The expanding member is provided with an outer annular surface 53a which may be either straight or slightly concaved from one end of the expanding member to the other and which is adapted to coact with the corre-

spondingly shaped and inclined inner surfaces 50c of the segments 50a. As in the form of the invention previously described, the force required to move the expanding member is limited by the fact that the expanding member and the segments have only an annular line contact except in one position of the expanding member, which may preferably be that position in which the core is fully expanded. The longitudinal movement of the expanding member 53 is adapted to be effected by a reciprocable rod 54 which is adapted to be actuated by fluid pressure mechanism similar to that described in connection with the actuation of the rod 14. This rod 54 is provided with a tapered forward portion 54a which fits within a correspondingly tapered central aperture formed in the expanding member 53 and the expanding member is secured upon this rod by a nut 55 which engages the threaded end of the rod. The forward portions of the inner surfaces of the segments 50a may be provided with transverse grooves 50d in which there is seated the outer edge portion of a disk 56 of leather, rubber or the like, which is adapted to prevent the access of dust or the like to the contacting surfaces of the expanding member 53 and the segments 50a. Other strips of leather, rubber or the like may be mounted between adjacent segments to extend longitudinally, as in the case of the strips 17, previously described, for the purpose of preventing the access of dust to the contacting surfaces of the segments and the expanding member between the radial faces of the segments.

The segments 50a are provided with rearwardly extending supporting arms 50g which project into the housing 52 and which are provided at their rear ends with enlarged portions 50h secured in apertures 58a formed in a spider or drum 58. This spider 58 has a hub portion provided with a bore 58b in which the rod 54 is slidably and rotatably mounted and this hub portion 58c of the spider is journaled in a roller bearing unit 59 secured in the rear end wall 52a of the housing. The portions 50f of the arms 50g which are adjacent to the spider 58 are resilient so that they permit some flexing of the segments in this region to allow the forward portions of the segments to expand contract, as permitted by the expanding member 53.

With the rear ends of the segments of the core having a fixed mounting in the rotatable member 58, as described above, it is necessary to apply the driving force to the segments for effecting their rotation only at an intermediate part of the structure and this is accomplished by a driving gear 60 which is located at the forward end of the housing 52 with its flanges 60a and 60b journaled in ball bearing units 61 and 62, respectively, which are mounted at the inner margins of the flanges 52b and 52c formed on the housing 52. The flange 52c has an extension provided with a groove in which is mounted an annular sealing member 63, of felt or the like, by which the access of dust to the roller bearing unit 62 is prevented. The driving gear 60 is provided on its outer side with teeth 60c which mesh with the teeth of a driving pinion 64 secured upon a driving shaft 65, as shown in Fig. 8, this shaft being adapted to be connected to a driving motor or other source of power by which the reel may be rotated during the winding operation. The driving gear 60 is provided on its inner side with a series of spaced teeth 60d, which enter the notches 50j formed in segments 50a, these notches or recesses being located at the marginal edges of the segments with the notches of two segments adapted to receive one of the teeth 60d, and with the notches of sufficient depth to permit radial movement of the segments, as in the form of construction previously described. By this arrangement, a positive driving force is applied to the segments 50a during the winding operation and this force is applied at intermediate parts of the segments, thus overcoming any tendency of these segments to tilt or twist longitudinally or laterally while the strip material is being wound thereon.

As heretofore mentioned, the rod 54 is adapted to be moved endwise by fluid pressure mechanism similar to that previously described for the purpose of actuating the expanding member 53. When this expanding member is moved toward the right to the position shown by full lines in Fig. 7, the forward ends of the core segments are expanded so that their outer surfaces 50b form a composite cylinder upon which the strip material 51 may be wound. When the expanding member 53 is moved toward the left to the position illustrated by dotted lines in Fig. 7, the segments 50a are adapted to be contracted so that their outer surfaces 50b then taper slightly toward the forward end of the device to facilitate the removal of the spiral coil of material which has been wound thereon. The contraction of the segments when the expanding member 53 is moved to its forward position is effected by fluid pressure mechanism including a series of cylinders 66 which extend radially inward from the outer wall of the housing 52 with their outer ends secured between the flange 52b and another annular flange 52d. A series of cylindrical pistons 67 are mounted to reciprocate in these cylinders and they have inner rounded ends 67a which are adapted to contact with the outer faces of the arms 50g of the segments of the core. The outer ends of these cylinders are provided with a series of ports in which are mounted supply pipes 68a leading from an annular supply pipe 68 located within the housing 52 adjacent to the flange 52d. Compressed air is supplied to the pipe 68 through a pipe 69 leading from an air compressor or other source of supply through the wall of the housing, as shown in Fig. 9. When compressed air is admitted to the cylinder by which the rod 54 is actuated, for the purpose of moving the expanding member 53 to the position shown by dotted lines in Fig. 7, compressed air may be simultaneously admitted through the pipe 69 to the various cylinders 66 so that the pistons 67 will be actuated to move the segments 50a inwardly as the expanding member 53 is moved toward the left, as viewed in Fig. 7.

Although certain forms of the invention have been shown and described by way of illustration, it will be understood that it may be constructed in various other embodiments coming within the scope of the appended claims.

We claim:

1. The combination in a winding reel, of a core comprising a plurality of radially adjustable segments upon which strip material is adapted to be wound, and means for applying power directly to said segments to rotate said core.

2. The combination in a winding reel, of a core comprising a plurality of radially adjustable segments upon which strip material is adapted to be wound, and means directly connected with each of said segments for applying power thereto to rotate said core.

3. The combination in a winding reel, of a core comprising a plurality of radially adjustable seg-

ments upon which strip material is adapted to be wound, and means for applying power to said segments adjacent the place of engagement therewith of the strip material for rotating said core.

4. The combination in a winding reel, of a rotatable core comprising a plurality of radially adjustable segments upon which strip material is adapted to be wound, means movable longitudinally of said segments for controlling the radial movement thereof, and driving means connected directly to said segments for rotating said core.

5. The combination in a winding reel, of a core comprising a plurality of radially adjustable segments upon which strip material is adapted to be wound, and driving means connected with said segments substantially midway between their ends for effecting the rotation of said core.

6. The combination in a winding reel, of a core comprising a plurality of segments of substantial length mounted for angular radial movement about their inner ends, the outer end portions of said segments being adapted to receive a coil of strip material wound thereon, and means for expanding and contracting the outer end portions of said segments by tilting said segments about their inner ends.

7. The combination in a winding reel, of a core comprising a plurality of segments of substantial length mounted for angular radial movement about their inner ends, the outer end portions of said segments being adapted to receive a coil of strip material wound thereon, means for expanding and contracting the outer end portions of said segments by tilting said segments about their inner ends, and driving means connected directly with said segments for effecting the rotation thereof.

8. The combination in a winding reel, of a core comprising a plurality of segments of substantial length mounted for angular radial movement about their inner ends, the outer end portions of said segments being adapted to receive a coil of strip material wound thereon, means for expanding and contracting the outer end portions of said segments by tilting said segments about their inner ends, and driving means connected to said segments at their intermediate points for effecting the rotation thereof.

9. The combination in a winding reel, of a rotatable core comprising a plurality of segments pivotally mounted at their inner ends, the outer end portions of said segments forming a composite cylinder upon which strip material is adapted to be wound, and driving means connected with the inner ends of said segments for rotating said core.

10. The combination in a winding reel, of a rotatable core comprising a plurality of segments pivotally mounted at their outer ends, the outer end portions of said segments forming a composite cylinder upon which strip material is adapted to be wound, and driving means connected with said segments at their inner ends and at their intermediate points for effecting the rotation of said core.

11. The combination in a winding reel, of a rotatable core comprising a plurality of complementary segments of substantial length, a rotatable member to which the inner ends of said segments are secured, said segments being flexible adjacent said rotatable member, means for expanding and contracting the forward portions of said segments, and means connected to intermediate parts of said segments for effecting the rotation of said core.

12. The combination in a winding reel, of a rotatable core comprising a plurality of radially adjustable segments upon which strip material is adapted to be wound, means for effecting radial movement of said segments, said segments having notches therein, a driving gear having teeth engaging said notches, and means for actuating said driving gear.

13. The combination in a winding reel, of a rotatable core comprising a plurality of radially adjustable segments upon which strip material is adapted to be wound, means for pivotally mounting the inner ends of said segments, means for expanding and contracting said segments by tilting them about said pivotal mounting, a driving frame surrounding a portion of said core, means for rotating said driving frame, and means for establishing a driving connection between said frame and said segments at the inner ends of said segments and at intermediate points thereof.

14. The combination in a winding reel, of a rotatable core comprising a plurality of radially adjustable segments upon which strip material is adapted to be wound, means comprising a longitudinally movable rod for controlling the radial movement of the outer end portions of said segments, a bearing member slidably engaged by said rod and having a rounded outer bearing surface, the inner ends of said segments having curved portions adapted to oscillate on said bearing member, and means for retaining said curved portions on said bearing member.

15. The combination in a winding reel, of a rotatable core comprising a plurality of radially adjustable segments upon which strip material is adapted to be wound, means comprising a longitudinally movable rod for controlling the radial movement of the outer end portions of said segments, a bearing member slidably engaged by said rod and having a rounded outer bearing surface, the inner ends of said segments having curved portions adapted to oscillate on said bearing member, means including a rotatable driving member for retaining said curved portions on said bearing member, and means for effecting rotation of said driving member.

16. The combination in a winding reel, of a rotatable core comprising a plurality of radially adjustable segments upon which strip material is adapted to be wound, means comprising a longitudinally movable rod for controlling the radial movement of the outer end portions of said segments, a bearing member slidably engaged by said rod and having a rounded outer bearing surface, the inner ends of said segments having curved portions adapted to oscillate on said bearing member, means including a rotatable driving member for retaining said curved portions on said bearing member, means for effecting rotation of said driving member, said driving member having a forwardly extending part, and means for establishing driving connections between said forwardly extending part and intermediate parts of said segments.

17. The combination in a winding reel, of a rotatable core comprising a plurality of radially adjustable segments upon which strip material is adapted to be wound, means comprising a longitudinally movable rod for controlling the radial movement of the outer end portions of said segments, a bearing member slidably engaged by said rod and having a rounded outer bearing surface, the inner ends of said segments having curved portions adapted to oscillate on said bear-

ing member, means including a rotatable driving member for retaining said curved portions on said bearing member, means for effecting rotation of said driving member, said driving member having a forwardly extending part provided with an annular member surrounding said segments, said segments having notches therein, and teeth carried by said annular member and engaging said notches.

18. The combination in a winding reel, of a rotatable core comprising a plurality of radially adjustable segments upon which strip material is adapted to be wound, a rotatable member having the inner ends of said segments secured thereto, said segments being flexible adjacent said rotatable member to permit radial movement of their outer end portions, means comprising a longitudinally movable rod for controlling the radial movement of the outer end portions of said segments, said rotatable member being mounted to rotate about said rod, a driving member surrounding said segments, and means for forming driving connections between said member and said segments and permitting a limited radial movement of said segments.

19. The combination in a winding reel, of a rotatable core comprising a plurality of radially adjustable segments upon which strip material is adapted to be wound, a rotatable member in which the inner ends of said segments are secured, said segments having resilient portions adjacent said rotatable member, means for effecting radial adjustment of the outer end portions of said segments, a driving member surrounding said segments, and means for forming a driving connection between said driving member and each of said segments and permitting a limited radial movement of each of said segments.

20. The combination in a winding reel, of a core comprising a plurality of radially adjustable segments, means including an expanding member located within said segments for effecting outward movement thereof, and expansible means mounted on the outer sides of said segments for effecting inward movement thereof.

21. The combination in a winding reel, of a core comprising a plurality of radially adjustable segments, means including an expanding member located within said segments for effecting outward movement thereof, and fluid pressure operated means for effecting radial inward movement of said segments.

22. The combination in a winding reel, of a rotatable core comprising a plurality of segments mounted to swing radially with their inner ends in substantially fixed positions, said segments having inner wedging surfaces, a tapered expanding member engaging said wedging surfaces, means for effecting movement of said expanding member axially of said core, and expansible means for maintaining said segments in contact with said expanding member.

23. The combination in a winding reel, of a rotatable core comprising a plurality of segments mounted to swing radially with their inner ends in substantially fixed positions, said segments having inner wedging surfaces, a tapered expanding member engaging said wedging surfaces, means for effecting movement of said expanding member axially of said core, and fluid pressure means for maintaining said segments in contact with said expanding member.

24. The combination in a winding reel, of a rotatable core comprising a plurality of segments mounted to swing radially with their inner ends in substantially fixed positions, said segments having inner wedging surfaces, a tapered expanding member engaging said wedging surfaces, means for effecting movement of said expanding member axially of said core, a rotatable member having connections with said segments for effecting rotation of said core, means movable with said member for maintaining said segments in contact with said expanding member, and means for actuating said rotatable member.

25. The combination in a winding reel, of a rotatable core comprising a plurality of segments mounted to swing radially with their inner ends in substantially fixed positions, said segments having inner wedging surfaces, a tapered expanding member engaging said wedging surfaces, means for effecting movement of said expanding member axially of said core, a rotatable driving member having connections with said segments for effecting the rotation of said core, means for actuating said driving member, and fluid pressure means mounted in a stationary position for maintaining said segments in contact with said expanding member.

26. The combination in a winding reel, of a plurality of radially adjustable segments, means movably mounted within said segments for controlling the radial movement thereof, and flexible means forming connections between adjacent segments.

27. The combination in a winding reel, of a plurality of radially adjustable segments having wedging surfaces on their inner sides, a tapered expanding member coacting with said wedging surfaces, and means connecting said segments for preventing the access of dust to the contacting surfaces of said segments and said expanding member.

28. The combination in a winding reel, of a plurality of radially adjustable segments upon which strip material is adapted to be wound, said segments having inclined inner surfaces, a tapered expanding member coacting with said surfaces, means for moving said expanding member, the opposed faces of adjacent segments having longitudinal grooves therein, and flexible sealing members having their edges mounted in said grooves.

29. The combination in a winding reel, of a plurality of radially adjustable segments upon which strip material is adapted to be wound, said segments having inclined inner surfaces, a tapered expanding member coacting with said surfaces, means for moving said expanding member, said segments being provided on their inner sides with aligning grooves, and a disk of flexible material seated in said grooves and extending transversely to the axis of said core.

30. The combination in a winding reel, of a plurality of radially adjustable segments upon which strip material is adapted to be wound, said segments having inclined inner surfaces, a tapered expanding member coacting with said surfaces, means for moving said expanding member, the opposed faces of adjacent segments having longitudinal grooves therein, flexible sealing members having their edges mounted in said grooves, said segments being provided on their inner sides with aligning grooves, and a disk of flexible material seated in said grooves and extending transversely to the axis of said core.

31. The combination in a winding reel, of a plurality of radially movable segments about which strip material is adapted to be wound, and an axially movable tapered expanding mem-

ber located within said segments and contacting therewith, said expanding member being arranged upon longitudinal movement thereof to tilt said segments whereby said expanding member has contact with said segments over surfaces of substantial area when the core is expanded and line contacts with said segments in all other positions of said expanding member.

32. The combination in a winding reel of a plurality of radially movable segments about which strip material is adapted to be wound, an axially movable expanding member located within said segments and having surfaces arranged to contact with the inner surfaces of said segments, and means for moving said expanding member longitudinally, said surfaces on said expanding member and said surfaces on said segments being arranged to change their relative inclinations upon longitudinal movement of said expanding member whereby said expanding member has contact with said segments over surfaces of substantial area in one position of said expanding member and line contacts with said segments in other positions of said expanding member.

33. The combination in a winding reel, of a core comprising a plurality of segments of substantial length mounted for angular radial movement about their inner ends, the outer end portions of said segments being adapted to receive a coil of strip material wound thereon, means movable longitudinally of said segments for effecting radial movements of said segments about their inner ends, and fluid pressure operated means for actuating said last-named means.

34. The combination in a winding reel, of a rotatable core comprising a plurality of radially adjustable segments upon which strip material is adapted to be wound, means for effecting radial movements of said segments, a driving member loosely surrounding said segments at a place removed from the strip material thereon, means for forming a driving connection within said member and said segments, and means for actuating said driving member.

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